

**COVID-19 VACCINATION RELATED MISINFORMATION IN THE SRI
LANKAN SOCIAL MEDIA LANDSCAPE:
COMMON MISCONCEPTIONS, SOURCES, CHANNELS AND COMMON
PRACTICES IN NAVIGATING MISINFORMATION AMONG PERMANENT
RESIDENTS AGED 18-60 YEARS IN THE COLOMBO DISTRICT**

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**PREPARED BY HEALTH PROMOTION BUREAU (HPB) IN COLLABORATION
WITH ORG ANALYTICS (PVT) LTD.**

**Covid-19 vaccination related misinformation in the Sri Lankan Social Media
Landscape:
Common misconceptions, sources, channels, and common practices in
navigating misinformation among permanent residents aged 18-60 years
in the Colombo District**

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1.0 Key Highlights Regarding Social Media Platforms

Social media seemed to have had a major role to play in the information landscape as a conduit for circulation of ideas and opinions among friends on which people seemed base their decisions on.

For an example, among those who had negative sentiments on vaccination due to perceptions of low efficacy, 76.7% had based their beliefs on the opinion of their friends. However, 95% among them had got to know their friends' opinion through social media.

Similarly, 77.8% of those who were initially doubtful of the efficacy of vaccination and later overcame it had done so based on their observations on social media.

The effect of this virtual community may have a major impact on the formation of attitudes and any research which does not explicitly take it into consideration may end-up underestimating the influence of social media in health information landscape.

While almost all (98.2%) of those who regularly used social media used it to consume information on current affairs only half (51.2%) were keen on using it as a platform to disseminate information.

The importance of this is the fact that much of the content circulated in social circuits are mostly disseminated through a group of people with a higher affinity towards sharing. If these nodes with a higher affinity for "content recirculation" could be identified through their social media behaviour, targeting them with scientific content could have a proportionally bigger impact on the information landscape.

In addition to this, factors like the level of trust in traditionally authoritative figures when it comes to health communication such as Doctors, Governmental Organizations, and International Non-Governmental Organizations seemed to be useful in predicting antivaccine sentiments. A deep neural network trained with these datapoints in the limited sample, proved to be reasonably accurate (85%-90%) although a larger sample would be needed for better results.

With over 70% (71.7%) believing Government Health Institutions to be credible sources of health information, they play a major role in shaping public sentiments and beliefs. Therefore, empowering such institutions to reach the masses through social media may have an enormous impact on the health information sphere of a community. The use of elements of virality such as social currency to optimize viral reach, seemed have paid rich dividends to the Health Promotion Bureau (HPB) of Sri Lanka. Modeling the published content to fit the ongoing public conversation at the given time had resulted in the Facebook page of the HPB managing to reach nearly 8 million (7.95 million) Facebook users during the 3rd quarter of 2021 which saw Sri Lanka's biggest Covid-19 outbreak to date.

2.0 Executive Summary

Nearly 8 million of the 21 million population in the country use social media regularly. This is over 40% of the country's adult population. Therefore, in-depth studying of the role played by social media in the information landscape is a prerequisite to health communication operations, including misinformation management. This need was proven beyond doubt during the Covid-19 pandemic with which an "Epidemic of Misinformation" of unprecedented proportions was observed. Even in Sri Lanka where the vaccination campaign was considered to be a major success, vaccine hesitancy was seen building up with the number of second doses and the number of third doses given was approximately 85% and 50% of the number of first doses of Covid-19 vaccines given. This study was commissioned to identify the Covid-19 vaccine-related beliefs among social media users and the role social media played in shaping them.

The study consisted of three phases. The Facebook page of the Health Promotion Bureau with over 600,000 followers and a reach of over 3 million per week during the height of the Covid-19 pandemic provided an ideal starting point for the study. The discussions generated in the comments section of posts related to Covid-19 vaccination published on the page provided a rich cross-section of the beliefs held by a diverse group of social media users during the time. Following the identification of the major themes emerging from the open dialogue, the second phase of the study was a series of focus group discussions held in the community to identify the belief system and information-seeking behavior of social media users who are not as vocal on public platforms. Colombo, the capital of the country with a nearly 5.6 million socio-demographically diverse population was selected as the setting. The third and final phase of the study focused on quantifying the prevalence of identified perceptions and beliefs likely to affect vaccine uptake among social media users and the role social media played in shaping them. Throughout the study, factors likely to promote vaccine hesitancy were explored along the constructs of the Health Belief Model, while subjective norms likely to affect behavioral intention according to the Theory of Planned Behaviour and the place of social media in the current information were also explored.

Almost all the regular users of social media claimed that they use it to stay up to date with current affairs although only half acknowledged using it to share their opinions and beliefs. The qualitative analysis suggested that it takes many more factors than merely agreeing with a post to convince a person into sharing it. However, some tended to be far more liberal in the decision to share than others and these are likely to be the important nodes in the information landscape of social media.

Qualitative studies in the community as well as in the comment section of vaccine-related posts showed misperceived adverse effects of the vaccine to be one of the main drivers of vaccine hesitancy. What people seem to interpret as evidence for this include;

- what they have seen on social and mass media,
- what they have observed among their friends and
- what they think they've experienced themselves.

While the influence on the first of the three points is obvious, it was interesting to note the role played by social media in points 2 and 3. In the second instance, many of the participants said that they got to know their friends' anti-vaccination sentiments through social media while qualitative analysis suggested that what people see on social media may play a role in implying causality between any discomfort, they experience post-vaccination and the vaccine. This is an important finding to inform the design of subsequent studies and emphasizes the need to delve deeper into information flow in social networks to identify the true impact of social media on a behavioral intention that goes beyond active health information-seeking behavior.

This is compatible with previous studies suggesting that false news tend to travel faster in social media purely due to the action of users. According to research, this is because such false news carries elements of novelty, fear, and surprise as is the case when it comes to exaggerated reporting of adverse effects as well.

Another theme that repetitively emerged was the belief that vaccines are low in efficacy. One major reason behind this notion seemed to have been the confusion among the public as to what exactly the vaccine was supposed to deliver. Mere infections among the vaccinated were cited as evidence of poor efficacy. Then there were population-level statistics such as the Covid-19 incidence in highly vaccinated populations which was used as evidence too. There were a few occasions where some in the public had tried to explain that what the vaccine is supposed to accomplish is to bring down the severity of the disease and mortality but comments as such were far in-between.

Some of the participants who have had doubts about vaccination claimed to have gotten over their fears through what they had seen on social media as well. Anecdotal evidence such as seeing their friends being vaccinated safely was said to have nudged them toward the decision to get vaccinated despite the lack of scientific rigor in such interpretations.

Another factor noted to play a role in promoting vaccine hesitancy was the notion that there were alternative (mostly herbal-based) therapeutic and preventive interventions that were far more efficacious and safer. The fact that some of these treatment modalities have been used for a long time to treat flu-like symptoms was discussed as evidence for their efficacy while the fact that they were herbal-based was suggested as sufficient assurance for safety. Promotion of traditional, as well as newly concocted herbal remedies, were liberally promoted on social media through comments sections, third-party posts, vendor posts as well as virtual conferences on video conferencing platforms.

The public generally tends to place a lot of trust in the subject matter expertise Of healthcare workers. However, it was noted that most of the people who harbored misperceptions related to the safety and efficacy of vaccines claimed to have noted similar content posted on social media by those who they consider being experts.

Certain fractions of the public were vociferous in their protest against regulations making vaccination mandatory in certain settings.

Many conspiracy theories surrounding the global drive for vaccination were noted and most of these conspiracies revolved around financial aspects and industry influence while a few had geopolitical themes.

Although no statistically significant associations were identified between socio-demographic factors and the likelihood of being completely vaccinated, it was noted that certain traits such as low trust in doctors, low trust in the government, and the reliance on a personal network to gain information were seen to be proportionally more prevalent among those with anti-vaccine sentiments. The absence of statistical significance might be due to the low power of the relatively small sample size. However, it was possible to train a deep neural network based on these factors to predict the likelihood of getting the vaccine with 85-90% accuracy. Yet, to increase its accuracy and reliability to serve practical purposes, it needs to be trained, validated, and tested on a larger sample.

Recommendations

Given the overwhelming importance of social media in shaping health-related behavioral intentions and the high level of complexity of the interactions, more research needs to be done on health-related information flow on social media.

Given the natural tendency for a rare (possibly negative) phenomenon to have better organic reach on social media, it would be prudent to facilitate the dissemination of less sensational anecdotes that describe the safety and efficacy of the vaccines. To maximize exposure to such positive content, mobilizing communities on social media through moderated groups would be helpful.

The impact of the promotion of untested, unsubstantiated treatment modalities seems to go beyond possible physical harm caused at the individual level. Even in the absence of such toxic features, the deleterious impact it has on the health delivery model seems to be considerable. Therefore, proactive management of dissemination of such content on social media needs to be conducted in collaboration with local authorities and subject matter experts.

How each social media user interacts with government health agencies, international health agencies and certain public figures may be useful in predicting the likelihood of vaccine uptake of the said individuals with a high degree of accuracy. Such predictions could be used to target individuals with tailor-made health messages. Closer collaboration between social media platforms and health communication experts will be needed to successfully implement such interventions.

A deep neural network trained with data including perceptions of the participants such as faith in government health organizations, International Health Organizations, the faith in doctors ect. Predicted the likelihood of an individual taking up the booster dose of the vaccine with moderate accuracy.

3.0 Introduction

Social media platforms have been the key piece for the dissemination of information, as it is the most widely used and inexpensive access to a large audience efficiently. However, this ease of approach has multiple other advantages and disadvantages. Social media platforms had a big role to play during the Covid-19 pandemic to reduce isolation and related crises by allowing the public to merely communicate and also disseminate information on protocols and regulations that were introduced from time to time (González-Padilla & Tortolero-Blanco, 2020).

Social media had a wealth of information that supported Humankind in overcoming mental health challenges, sharing information on access to medical resources, treatment information, vaccination and cure, and details on personal protection and protocols. Thereby social media supports the ones anxious about the pandemic and individuals challenged by being infected by the pandemic (González-Padilla & Tortolero-Blanco, 2020; Abbas, Wang, Su, & Ziapour, 2021). The information available on these social media platforms for its users are both correct and incorrect information. Research claims that of the wealth of information that is available, falsehood reach is faster and farther when compared to the accurate information that is available in the free space (Chou, Gaysynsky, & Cappella, 2020).

Background

Covid-19 altered living and lifestyle for everyone across the world on the other hand the internet alas Social Media have altered and mustered the upcoming adults to be reliant on them for communication, purchasing, information, and news (Gangadharbatla, Bright, & Logan, 2014). During the pandemic when social interactions were distant for young and old, social media turned out to be everyone's alternative, research shows a strong correlation between social media usage for learning & knowledge, social support, and capacity building during the advent of Covid-19 (Saud, Mashud, & Ida, 2020).

When focusing on social media there are multiple platforms at the present however, the most popular platform of all is Facebook with over 2.89 billion active monthly users as of January 2022 (Statista, 2022). In Sri Lanka, the Facebook user base is over 8 million as of January 2022. Therefore, Facebook is the popular social network in Sri Lanka.

Of this user base, Sri Lanka Health Promotion Bureau (HPB) has been able to reach 3.6million users and its Facebook page is followed by over 600,000 users. However, during the 3rd quarter of 2021 which is also when the Covid-19 Delta variant was at the rise making it Sri Lanka's biggest Covid-19 outbreak to date, the Facebook page of the HPB managed to reach nearly 8 million (7.95 million) Facebook users. Hence reaching Sri Lanka's Facebook totality. This indicates that Sri Lankan to has sought Facebook for Covid-19 related information.

Spanning across the second half of 2022 was when HPB along with the government of Sri Lanka (SL) promoted and attempted to expedite vaccination against Covid-19.

Thereby HPB SL through their Facebook page aggressively promoted and shared information concerning vaccine and vaccination procedures.

As reported by Abbas et. Al (2021) locals sought Facebook for information, especially the upcoming youth and young adults who rely on it completely (Gangadharbatla, Bright, & Logan, 2014). However, as reported by González-Padilla & Tortolero-Blanco (2020) the expertise and skills required for screening the reliability and credibility of such information that is available on Facebook were not present. The user engagement on the Facebook post made by HPB gave limelight to this concern that prevailed among the local users. In spite of HPB and the World Health Organization trying to educate Facebook users on how to filter reliable and credible information against false information, the vaccination is.

Problem Statement

With Covid-19 being available for vaccinating the general public, HPB SL aggressively promoted and shared vaccination information on their Facebook page, and vaccination centers were informed to the People through mass media as well. Nonetheless, People's responses to the post on social media were not promoting and positive concerning vaccination. When looking at database records concerning infected cases and vaccinated populations in the country. By the end of the third quarter of 2021 of the 21.9 million population of the country over 27% were reported infected and 200 plus deaths daily. However, up to date only close to 8 million (that is 55%, inclusive of the front line of defense) are fully vaccinated (inclusive of a booster), whereas there are over 7 million individuals who are eligible to take booster but have not and 3 million who have not obtained the second vaccine (Presidential Secretariat, 2022). The negative engagements of the People with social media communication and negative social media advocacy would have greatly contributed to poor turnout in the vaccination process that was carried out. A surge in vaccination was only seen after the government made it compulsory to be vaccinated against the pandemic, a minimum of 1.1 million individuals (inclusive of front liners) has been vaccinated before compulsion (MOH, 2022). Until compulsion was put into place there was a passive interest in being vaccinated, social media advocacy too was enabling such perception. Hence the study proposes to study the sentiments with regard to vaccination, the communication landscape to communicate and promote health information and understand processes that lead to social media miscommunication among Sri Lankans.

General Objective

To identify common misconceptions, sources, channels, and common practices in navigating misinformation regarding Covid-19 vaccination

Specific Objectives

- To identify Covid-19 vaccine-related sentiments of those who engage with vaccine-related posts on the Facebook page of the Health Promotion Bureau from 01/02/2021 to 01/02/2022

- To explore sources of Covid-19 vaccine-related sentiments among permanent residents aged 18-60 years in the Colombo District
- To describe Covid-19 vaccine-related sentiments and understand common practices in navigating health information among permanent residents aged 18-60 years in the Colombo District

4.0 Literature Review

Covid-19 the global pandemic led us, Humans, to a communication crisis due to regulations that were in place. This spread of the virus also made evident to experts the amplified rate at which misinformation was spreading on social media (Chou, Gaysynsky, & Cappella, 2020). The advancement of technology has been able to keep us Humans connected and informed while keeping us safe in these tough times. However, this very same tool also has amplified the current pandemic and continues to sabotage global response and jeopardize the measures that are being taken to control the pandemic (Volkmer, 2021). Social media or being online was popular during the wake of the pandemic where young adults were found to be active and interacting on an average of five social media platforms (Volkmer, 2021).

Health misinformation has been a reality even before Covid-19, however the outbreak of the pandemic and the changes it forced us to adopt amplified the concern about health misinformation (Volkmer, 2021). In a review study on health misinformation that entailed 69 studies that focused on a wide range of health topics and social media. The studies were categorized into; vaccines, drugs or smoking, non-communicable diseases, pandemic, eating disorders, and medical treatment. The review paper concluded that followed by smoking and substance miscommunication was vaccine-related health miscommunication which had a prevalence of 43% with the papillomavirus vaccine being the most affected at the time (Eysenbach & Powell, 2002; Suarez-Lledo & Alvarez-Galvez, 2021).

Rolls and Messey (2021) in their review of the spread of health-related misinformation on social media, emphasized the factors that lead to such misinformation. Health literacy is the first factor, which focuses on the ability an individual has to effectively evaluate health-related information, while e Health literacy spans health information that is available online. When exposed to health information, an individual with adequate health literacy would have the analytical and skill capacity to evaluate the accuracy of the online content (Rolls & Massey, 2021). During the outbreak of the global health body alas the United Nations High Commissioner for Refugees (UNHCR) engaged in advocating and sharing knowledge with the public on their social media platform to promote improved health literacy at difficult times. UNHCR made attempts to simplify health literacy by advocating the informed process of screening accurate information and providing awareness on the spread of false information/ misconceptions (UNHRC, 2021; UNICEF, 2020). However, these efforts were a waste, though there has been sufficient literacy known or learned, the second screening is done through a social lens where health behavior and belief of social groups are taken into account. As an outcome, their decisions on the content are likely to lead to poorer health outcomes (Rolls & Massey, 2021).

A study that was done to help identify and differentiate false and accurate information on social media, found that false information shows different emotional patterns compared to real information. False information is said to have such emotional inclination because emotions play an essential role in deceiving the reader into believing the false information that has been posted. To gain readers' attention false news creates a surprise or a higher emotional approach (14).

In a study that was done among Generation Z social media users on their ability to identify misinformation about 59% of them can identify however they are actively countering such content, only 35% actively counter while others merely ignore it. This ignorance and cohort of individuals who are unable to identify false information thereby contribute to miscommunication (Volkmer, 2021).

Theoretical Background

The third-person effect (TPE) hypothesis

Johansson (2005) in his study to verify the third-person effect hypothesis, studied on political attitudes of a cohort, in this he concluded that others' political attitude is dependent on mass media or people from their social environment (Johansson, 2005). Thereby concluding that, "The third-person effect perceptual hypothesis predicts that individuals will perceive media messages to have greater effects on other people than on themselves. A behavioral hypothesis predicts that third-person perception (i.e., seeing others as more influenced) will lead to support for restrictions on media messages." (12, p1).

At present time and day where social media has evolved to be the platform for connection and information (i.e social environment and media) (Volkmer, 2021). Social Media scholars are exploring this hypothesis to understand social media behavior. Jan and Kim (2018) endorsed the application of TPE to social media by adopting the theory in their study on fake news found in Social Media. Even in the context of social media where social distance is prevalent, individuals who are exposed to fake news believe that the news would affect their out-group members compared to their in-group (Talwar, Dhir, Singh, Virke, & Salo, 2020). As the present study also proposes to focus on misinformation on Facebook during Covid-19 it would be appropriate to invoke this theory in the exploration.

5.0 Methodology

The study would be composed of three main components

Component 1: A Descriptive Analysis of vaccine-related posts on the FB page of the HPB

This component will be conducted to identify vaccine-related sentiments of those who have engaged with vaccine-related posts on the FB page of the HPB within the last year.

This will involve:

1. Identifying vaccine-related posts on the FB page of the HPB within the last year
2. Thematic Analysis of the comments on all vaccine-related posts on the FB page of the HPB within the last year

Identifying vaccine-related posts on the FB page of the HPB within the last year

This will include all posts:

- Carrying information on vaccination against Covid-19, available vaccines, and potential adverse effects
- Published on the Facebook page of the Health Promotion Bureau
- From 01/02/2021 to 01/02/2022

Study Design:

A review of all comments made on all vaccine-related posts on the FB page of the HPB within the last year

Study Setting:

Facebook page of the Health Promotion Bureau

Study Period:

All comments made on all vaccine-related posts on the FB page of the HPB from 01/02/2021 to 01/02/2022 will be reviewed retrospectively within the period of 01/05/2022 – 15/05/2022

Study population:

All comments made on all posts carrying information on vaccination against Covid-19, available vaccines, and potential adverse effects published on the Facebook page of the Health Promotion Bureau from 01/02/2021 to 01/02/2022

Inclusion Criteria:

All comments on posts,

- Carrying information on vaccination against Covid-19, available vaccines, and potential adverse effects
- Published on the Facebook page of the Health Promotion Bureau
- From 01/02/2021 to 01/02/2022

Exclusion criteria:

Comments made on,

- Posts created by third parties and cross-promoted on Health Promotion Bureau Facebook Page
- Posts run explicitly as paid advertisement campaigns
- Any comments dated 02/02/2022 and after

Sampling size calculation:

All the comments will be analyzed

Sampling technique:

No sampling technique will be employed as the study would be incorporating all comments made on Covid-19 vaccine-related posts on the HPB Facebook page.

Data collection and study implementation:

Only publicly available and visible comments will be included. All comments on identified posts will be extracted (scraped) using R and the social listening tool of the Health Promotion Bureau. Commenters will be given pseudonyms.

The researcher will continue to maintain a reflective journal to record his reaction, expectations, assumptions, and biases for analysis.

Administrative clearance will be sought from the Director of the Health Promotion Bureau. Ethical clearance will be obtained from the Ethical Review Committee of the National Institute of Health Sciences.

Quality of data:

The credibility of this study will be enhanced through validation strategies such as triangulation, researcher reflexivity, and peer debriefing. Data will be triangulated across all three modes of data collection in-depth interviews, focal group discussions, and key informant interviews. Stake's (1995, p.131) "Critique checklist" will be used to assess the quality of the report.

Data Analysis:

All interviews, journal entries, and field notes will be transcribed into Microsoft document files before analysis. All files will be stored in a biometrically locked personal computer operated solely

by the principal investigator. Qualitative analysis software Atlas. It will be used for coding and analysis of data. A thematic analysis will be carried out following the Braun and Clarke (2006) guidelines.

Administrative requirements:

Administrative clearance will be sought from the Director of the Health Promotion Bureau.
Ethical considerations:

Only publicly visible comments on the timeline of the Health Promotion Bureau Facebook Page will be included. Names of the commenters or any personally identifiable information will not be included in the analysis or the report.

The learnings and insights of the data collected will be shared with the Health Promotion Bureau Social Media Circuit to support them in future communication strategies. Raw data will only be accessible to the researchers and would not be shared with any other agencies and it would password protected.

This research will have no commercial, financial, intellectual, or any other conflict of interest. Ethical clearance will be sought from the Ethical Review Committee of the National Institute of Health Sciences.

Component 2: A qualitative study of opinions on Covid-19 vaccination

Component 2 will be a qualitative assessment of vaccine-related sentiments among permanent residents aged 18-60 years in the Colombo District

Study Design:

Each sub-component will utilize in-depth interviews and Focus group discussions

Study Setting:

Focus group discussions will be conducted among permanent residents aged 18-60 years in the Colombo District. According to the Medical Statistics Unit, Ministry of Health, (2021) 2,428,443 live in the Colombo District.

Study Period:

The study will be carried out during the period of April 2022 to June 2022 and data collection will be carried out from April 2022 to May 2022.

Study population:

The Study population will be permanent residents aged 18-60 years in the Colombo District who had been living in the province since April 2021.

A Study Unit:

Inclusion criteria

- Adults over the age of 18 – 60 (male or female)
- Permanent resident of the surveillance sites (since April 2021).

Exclusion criteria

- Institutionalized individuals
- Pregnant and lactating women
- Any debilitating physical or mental illness or developmental intellectual disability

Sampling size calculation:

Data will be collected until the point of saturation is reached.

Sampling technique:

In order to gain multiple perspectives in the study area, Focus group discussions and in-depth interviews will use the maximum variation sampling strategy (Creswell, 1998). Individuals will be selected based on three dimensions; gender, educational level, and family income. Individuals will be selected with the help of a gatekeeper. The principal investigator will have several discussions with the gatekeeper and the gatekeeper will contact individuals that meet the required criteria. Sampling will continue until the point of saturation is reached with a minimum of 6 focus group discussions and 8 in-depth interviews for a given objective.

Development of the data collection instrument:

Data will be collected through Focus group discussions and in-depth interviews.

A probing guide for in-depth interviews and Focus group discussions will be developed with the help of a sociologist, psychologist, and a consultant community physician with a special interest in health promotion.

Probing guides will be used to collect information on (based on the findings of component1):

1. Sentiments on vaccination in general
2. Sentiments on vaccination against Covid-19
3. Identified sources providing information regarding vaccination and related matters
4. How different sources of information are perceived

Data collection and study implementation:

Interviews will be conducted in a place the interviewee is comfortable with the principal investigator. Study subjects will be informed that they can give pseudonyms if they wish to do so. The interviewee will be reminded that breaks are allowed whenever they feel that they need one. Each study subject will be informed of the study objectives and written consent will be obtained. The interviews will be audio recorded. The researcher will continue to maintain a reflective journal to record his reaction, expectations, assumptions, and biases for analysis. Administrative clearance will be sought from the Provincial Director of Health Services, Western Province and the Chief Medical Officer of Health of the Colombo Municipal Council following the ethical approval from the Ethical Review Committee of the National Institute of Health Sciences.

Quality of data:

Validation strategies such as triangulation, researcher reflexivity, and peer debriefing will be utilized to enhance the credibility of the findings of this qualitative component of the study. Data will be triangulated across the two modes of data collection: in-depth interviews and focus group discussions. Stake's (1995) "Critique checklist" will be used to assess the quality of the report.

Data Analysis:

All interviews, journal entries, and field notes will be transcribed as Microsoft Document files before analysis. All files will be stored in a biometrically locked personal computer operated solely by the principal investigator. Qualitative analysis software Atlas. It will be used for coding and analysis of data. A thematic analysis will be carried out according to the Braun and Clarke (2006) guidelines.

Administrative requirements:

Administrative clearance will be sought from the Provincial Director of Health Services – Western Province, the Chief Medical Officer of Health of the Colombo Municipal Council following the ethical approval from the Ethical Review Committee of the National Institute of Health Sciences.

Ethical considerations:

Once eligible subjects are recruited, they will be briefed on the research and a comprehensive information sheet will be provided. They will explicitly be informed of the voluntary nature of participation and that they are free to withdraw consent at any stage of the research. They will further be explained that refusing to take part in the study will have no effect on the public services they receive. They will be given opportunities to ask questions and clarify any doubts before the commencement of the data collection as well as at any point throughout the process. Following this written consent will be obtained from those who agree to take part in the study.

Interviews will be conducted in a place the subject feels comfortable in. The subjects will be explained stringent measures to ensure the confidentiality of information received. Transcribed data will be kept in a biometrically locked portable computer with the principal investigator. Information by which a person can be identified will not be released through publication or otherwise.

Collected data will be used to identify specific communication objectives for a mass media campaign addressing obesity and would benefit the subjects indirectly.

This research will have no commercial, financial, intellectual, or any other conflict of interest. Ethical clearance will be sought from the Ethical Review committee of the National Institute of Health Sciences.

Component 3: A Quantitative Study

This component will be a descriptive cross-sectional study intended to describe vaccine-related sentiments and the utilization of best practices in navigating health information among permanent residents aged 18-60 years in the Colombo District.

Study Design:

A community-based descriptive cross-sectional study.

Study Setting:

The study will be conducted in the Colombo District. According to the latest census data available live in the Colombo District. The list of households will be compiled using the voters' lists in these Grama Niladhari (GN) (village level administration divisions) areas.

Study Period:

The study will be carried out during the period of May 2022 to July 2022, and data collection will be carried out from May 2022 to June 2022.

Study population:

The Study population will consist of individuals from 18-60 years of age who have been permanent residents of Colombo District since April 2021.

A Study Unit**Inclusion criteria:**

- Adults between 18-60 years of age
- Permanent resident of the surveillance sites (since April 2021).

Exclusion criteria:

- Institutionalized individuals
- Pregnant and lactating women
- Any debilitating physical or mental illness or developmental intellectual disability

Sampling size calculation

The sample size for the study will be decided by calculating the minimum sample size required to detect the prevalence of factors measured under each subcomponent with a pre-determined level of precision and confidence.

The required sample size will be calculated using a formula for the sample size for the estimation of prevalence (Lwanga S.K. & Lemeshow S., 1991).

$$n = \frac{Z^2(1-p)}{d^2}$$

n= minimum sample size for simple random sampling

Z= standard normal deviation: set at 1.96, corresponding to a confidence level of 95%

d= The degree of precision: set at 0.05

p= Percentage of vaccinated adults in Colombo District (02 doses – 85%)

Currently, there is no study done on the use of WHO-recommended best practices in navigating health information on Social Media.

Therefore, to obtain a sample size sufficient to calculate the prevalence of these factors with a predetermined level of precision and confidence, the prevalence will assume to be 0.5 to obtain the maximum sample size. If the prevalence of the said factor could be estimated for the given population depending on the findings of the pilot study, it will be used to refine the sample size calculation.

Since the multistage sampling method will involve cluster sampling, the effect of clustering will be overcome by making a correction for the design effect (Lwanga S.K. & Lemeshow S., 1991).

Minimum sample accounting for the cluster effect

$N = \text{Design effect} \times n$

Design effect = $1 + (b-1) \rho$

"rho" indicates the degree of homogeneity of units within a cluster. Due to the unavailability of similar studies done in a similar setting in the past, the degree of homogeneity of the study population in relation to the factors assessed could not be estimated. Therefore, the design effect will be taken as 2

$N = 2 \times 196 = 392$

Allowing for a 10% non-response rate, the required sample size will be 436

Sampling technique:

A multistage cluster sampling method with stratification will be used to select a sample representative of the 18-60-year-old population permanently residing in the Colombo District.

Stage 1:

- a. Stratification of the population into
 - i. Urban sector
 - ii. Semi urban sector
 - iii. Rural sector

- b. Allocating clusters to each stratum proportionate to its adult population size

Stage 2:

Selecting clusters within the stratum with Probability Proportionate to Size (PPS) method

Stage 3:

Selecting households within the cluster

Stage 4:

Selecting an eligible adult from each identified household

Stage 1: Stratification and allocation of clusters

Due to the largely varying sociocultural characteristics between urban and rural populations, the study population will be stratified into urban and rural sectors. The list of Grama Niladharee Divisions (GND) will be obtained from the Census and Statistics Division in the District Secretariats of Colombo, Gampaha, and Kalutara. GND belonging to the Municipal Councils and Urban Councils will be classified as the urban sector stratum and the GND belonging to Pradeshiya Sabhas will be classified as the Rural sector stratum. Grama Niladharee divisions belonging to estates will be classified as Estate GNDs.

Stage 2: Selection of clusters

The primary sampling unit will be a GND which constitutes a cluster. The 18-60-year-old population in each GND will be considered as the size and PPS will be used to select GNDs within the stratum.

Stage 3: Identification of housing units within the cluster

Within the GND, each household will be the unit of enumeration. The coordinates of the centroid of each GND will be calculated with the QGIS open-source software. This centroid will be the point at which the data collection will begin in a GND. Starting from that point a sample of households would be selected according to a random walk sampling method.

Stage 4: Identifying a respondent within a household

The residents in the household will be enumerated according to their age and one will be randomly selected and invited to take part in the study. If the chosen person is not at home at that time, the interviewer would return. If the chosen respondent was not available at home after two visits or if he does not consent, he/she would be taken as a non-respondent and the interviewer will approach the household next in line.

Quality of data:

Data collected on the field would be randomly backed and checked by a third party to ensure the truthfulness of data. Further, the statistical measure would be adopted to identify the validity and reliability of the data before further analysis is carried out.

Data Analysis:

All questionnaires would be first entered and cleaned as Microsoft document files prior to data analysis. All files will be stored in a biometrically locked personal computer operated solely by the principal investigator. Quantitative analysis software SPSS and R will be used for the analysis of data. An appropriate correlation analysis will be carried out after identifying the normality of the data.

Administrative requirements:

Administrative clearance will be sought from the Provincial Director of Health Services – Western Province, the Chief Medical Officer of Health of the Colombo Municipal Council following the ethical approval from the Ethical Review Committee of the National Institute of Health Sciences.

Ethical considerations:

Once eligible subjects are recruited, they will be briefed on the research and a comprehensive information sheet will be provided. They will explicitly be informed of the voluntary nature of participation and that they are free to withdraw consent at any stage of the research. They will further be explained that refusing to take part in the study will have no effect on the public services they receive. They will be given opportunities to ask questions and clarify any doubts before the commencement of the data collection as well as at any point throughout the process. Following this written consent will be obtained from those who agree to take part in the study.

Interviews will be conducted in the respondent's households. The subjects will be explained stringent measures to ensure the confidentiality of information received. Completed questionnaire data will be kept in a biometrically locked portable computer with the principal investigator. Information by which a person can be identified will not be released through publication or otherwise.

Collected data will be used to identify specific communication objectives for a mass media campaign addressing obesity and would benefit the subjects indirectly.

This research will have no commercial, financial, intellectual, or any other conflict of interest. Ethical clearance will be sought from the Ethical Review committee of the National Institute of Health Sciences.

6.0 Findings

Component 1: A Descriptive Analysis of vaccine-related posts on the FB page of the HPB

Overview

The comments section of the vaccine-related posts posted on the Health Promotion Bureau Facebook page creates a vivid cross-section of vaccine-related beliefs and perceptions of the public.

These comments were analyzed to identify factors influencing vaccine-related attitudes along the constructs of the Health Belief model.

Beliefs related to;

- Perceived susceptibility
- Perceived severity
- Perceived benefits of vaccination (Efficacy)
- Perceived barriers (Adverse effects) were thus explored

Perceived Threat of Covid

Factors likely to affect the perception of the threat posed by Covid-19 included

Covid-19 is now a mild virus

Several people seemed to be confident in Covid-19 infection being quite trivial which was seen in comments such as "*If your mind is healthy, you'd be fine*". Some comments were specific to variants such as Omicron. "*Omicron is a very weak virus. Nothing more than the flu*".

Some were of the opinion that standard preventive measures would ensure that they do not end-up infected, and that vaccination was not needed in that case as was seen in comments such as "*if you can reduce movement and practice social distancing why would anyone need the vaccine?*"

Alternative care system is effective against Covid-19

Comments suggesting alternative practices in place of vaccination were commonly seen in comment threads. Comments such as "*When we amazing alternatives such as 'hela' (an indigenous) medical system getting the jab isn't the only option*", and "*We would take nothing, but out indigenous medicine*" were commonly seen.

There were many remedies that were marketed as effective preventive and therapeutic medication on social media at the time. Comments referring to such treatment like "*There are medicines with even the patent*". Nobody gives them any publicity. They all want us to sign our own death warrant and get jabbed" were also common.

These alternative medications were suggested not only as a treatment against Covid-19 but also against the alleged debilitating adverse effects of the vaccine. Comments such as "*If the immunity*

of those who took the vaccine is to be restored, herbal treatment is the only way" carried this sentiment.

Some went as far as to share recipes of herbal concoctions online. These concoctions were allegedly capable of preventing infection and improving oxygenation of blood etc. Some of the commenters claimed that they cure around 500 people every day by circulating recipes of such herbal concoctions through social media. Invitations for virtual conferences on alternative treatment for Covid-19 were also seen to be posted in the comments section.

Perceived Benefits of Vaccination

The vaccine has low efficacy

People were questioning the population-level efficacy of the Covid-19 vaccine. There were questions such as "*Which country controlled Covid-19 through vaccination?*", "*Isn't it in those countries where they make vaccines that most patients are seen?*"

There was visible confusion as to what the purpose of vaccination is. Many seemingly were wondering why social distancing and other preventive measures were still needed if the vaccine was effective. They took the continuation of Covid-19 restrictions to imply the low efficacy of the vaccine. This was evident in sarcastic comments such as "*If the vaccine is effective shouldn't people be allowed to walk around without masks*", and "*If you are confident in breaks, why would you need airbags?*".

Perceived Risks of Vaccination

Much of the comments against vaccines were centered around perceived adverse effects of the vaccine.

First-hand narratives of adverse effects

The observations and experiences cited were at different levels. Some were said to be first-hand experiences. Comments like "*I was perfectly fit before. But after first two doses of vaccine, I developed a bad backache*", and "*I feel sleepier than before. I went to a class at 9 and was asleep at 9.15*" speak of such experiences. It is observed that most of the perceived adverse effects experienced firsthand said to be either trivial or non-specific.

A recurring theme in this category of observations seems to be those who are engaged in manual labor claiming that they feel fatigued after taking the vaccine. Some were seen commenting saying "*I work in paddy fields. I took just one dose and haven't been able to work properly since then*". Those who work with me are quite old. They say the same"

Anecdotal observations

There were many comments claiming to know someone who was severely affected by the vaccine. These comments included comments such as "*A healthy man in our neighborhood died after taking the vaccine*", "*A gent in our village got a stroke 2 days after vaccination and died*". Some commenters were seen to be aggressively resisting advice to vaccination in comments

such as *"Idiots who know nothing ask innocent people to go get vaccinated. Four people I know died after getting a stroke following vaccination"*.

Speculations

Another major recurrent theme was people claiming that vaccines have adverse effects without giving any specific examples. General comments such as *"See how many people have been bed-bound after vaccination. Don't let anyone take the vaccine"* were often noted in comment threads on vaccine-related posts.

Some comments such as *"See how many artists have died during the recent days. They have all taken the vaccine and none of these deaths were due to the Covid-19 illness either"* seem to be attributing deaths among certain vaccinated groups to vaccine-related side effects. This particular comment might have been based on the notion that many artists had a preference in getting the first dose of vaccine before the others in respective age groups.

However, among these different levels of observations, people seem to place more weight on allegedly personal experiences and were ready to defend such claims against those who questioned them. Comments such as *"How can you question what this child claims to have experienced. He's the one who experienced it. Not you"* were seen commonly in these comment sections.

Vaccination impairs the immune system

Another interesting notion held by the anti-vaccination community, in general, was the perception that vaccination will impair natural immunity. This was repetitively seen in comments such as *"The vaccine harms out the natural immune system. Then we are entirely dependent on that"*

Questioning claims of adverse effects

Quite a few comments in the thread were seen defending vaccination against various allegations of adverse effects as well. Refuting claims that the vaccines kill apparently healthy people one had commented saying *"Yes it warrants an investigation to see why only people you know die after vaccination. It is, of course, people who tend to look like they are healthy that sometimes die from strokes and heart attacks"*.

No plausible causality

Some were seeing questioning the logic of attributing the death to the vaccine. Comments such as *"How do you know exactly that it was because of the vaccine?", "Who gave the cause of death? Was it you?"* were intermittently seen in these threads.

Adverse effects are rare

A few commenters were trying to explain that adverse effects are rare although possible. One had commented saying *"even children who take vaccines sometimes develop allergies. But that doesn't happen to everyone"*.

First-hand narratives

There were many who had commented on claims of adverse effects highlighting their first-hand experiences. Comments such as "*All in my household are over 70, my sister is over 80 now. They took all three doses and are doing perfectly fine. Don't spread false rumors*", and "*Everyone in our family got the vaccine. We didn't have any adverse effects*" were seen on these comment threads as replies to some of the comments on adverse effects.

There were also people who took examples from the population to refute claims of adverse being common. One had commented saying "*If taking the booster dose makes you bed-ridden, the front-line health workers would have all been hospitalized by now*".

Action needs to be taken against those who spread misinformation

Some people on these threads had questioned why the authorities wouldn't take action against those who spread false information. Such sentiments were seen in comments such as "*Don't mislead people. Authorities should take action against these people!*"

Other

Ambiguity in communication and misinterpretation

Perceived ambiguity of communication and misinterpretation of facts seem to be common among comments on vaccine-related posts.

Many sources with the list of potential adverse effects of the vaccine were cited to give the impression that the vaccine is harmful. Comments such as "*Keep aside your bigotry and go read the FDA document itself. Then you won't have to exhibit your ignorance anymore*", and "*The vaccine comes with a booklet of 20 adverse effects*" were seen frequently.

Others had seen the lack of discussion of adverse events in mainstream media as an effort to cover up them. This was seen in comments such as "*Then do you intend to say that FDA and even Pfizer are lying about their own vaccine? These are discussed in international news and even on official websites. Only filtered stuff is shown on local media*".

Trials were hurried and substandard

A school of thought evident among comments was that this vaccine isn't trustworthy since it had not been tested with the same scientific rigor. The short period it took to introduce the vaccine had been put forward by many as the reason for this notion.

Comments such as "*Other vaccines are tested for years before being introduced to people. This vaccine must still be in the trial stage*" were common.

Authorities are not being accountable

Comments on vaccine-related posts have a significant level of confusion concerning accountability. It was interesting to note that the consent form signed before vaccination was seen as a way to absolve the authorities from the legal repercussions of any adverse effects caused.

This was evident in comments such as *"If they are so certain, would they make us sign accepting that they are not responsible? Think if you have a brain"*.

Conspiracy theories

Conspiracy theories that went beyond implying a lack of accountability were seen frequently in these comment sections. Although these conspiracy theories were seen to be diverse, they were revolving around the notion that vaccination was a scam to loot money.

These sentiments were noted in comments such as *"Ahh and that's the commission from injections talking"*, and *"The health sector has already been sold for money"*.

Another common theme seen repeatedly among conspiracy theories was that the vaccines will be used to impair the natural immune system creating a total reliance on vaccines for immunity. *"Vaccines will destroy our immune system and start controlling our immunity. Then there'd be no other option but to top-up vaccines now and then."* This is one such comment.

Among the many theories present, some had a geo-political connotation. Comments like *"The truth has come out. Both the virus and the vaccines are tools used concur all nations"* and *"What love have these world leaders have for us. Those who can't feed starving children seem to be so eager to give us vaccines"* were two such comments.

Resistance against regulations

There was an ongoing dialog about making vaccination records mandatory to enter public premises. This suggestion was met with stiff resistance in comment sections of vaccine-related posts. Comments such as *"First they tried to threaten and terrorize us into taking the vaccine. It is good that there were three wise doctors to take legal action against such coercions. If not, they would have continued to do it even today"* were commonly seen.

Discussion and Conclusion

The comments section of vaccine-related posts was flooded with comments sharing various beliefs regarding the vaccine. This online forum had turned into a platform where people discussed their vaccine-related beliefs with each other and carried a wealth of insights into a diverse set of beliefs.

There were many claims of post-vaccination adverse effects. Most of the first-hand observations were non-specific. Most of the alleged serious complications tended to be hearsay. Some seemed to interpret the lack of open conversation on adverse effects as a sinister attempt to cover up. However, the number of such comments was significant and set the tone of the comment section.

There were concerns about the vaccine efficacy as well. This seemed to be due to unrealistic expectations and anecdotal observations of vaccinated individuals getting infected. At times this notion was based on observing the spread of the illness in communities with high rates of vaccination.

Interestingly there were those who would try to clarify doubts and debunk myths in the comment section itself. Although they were outnumbered, some of them tried to explain how rare adverse effects are and noted the fact that some claims of adverse effects have no evidence for a relationship to vaccination than the mere temporality of the event.

Another reason given for vaccine hesitancy was the belief that there were extremely effective alternative approaches to prevent/treat Covid-19. Some of these commenters had claimed to be involved in propagating such methods on social media as well.

Many seemed to be unaware of how a vaccine works and was seen to harbor the idea that the immunity generated by a vaccine is foreign to the body. Many seemed to think that vaccines impair the immune system.

There were many conspiracy theories shared in the comments section and many comments claiming that the vaccine is still being tested /not properly tested by following the usual standards.

The comments section in general had a negative connotation, increasingly towards more recent times, and may have resulted from attributing many disease conditions to vaccination as well as the general lack of information and skepticism towards the system.

Component 2: A qualitative study of opinions on Covid-19 vaccination

Overview

The decision to take the vaccine is affected by the information a person receives. Therefore, one objective of the qualitative analysis was to identify the information-seeking behavior of people in the community and the role social media plays in it.

According to the Agent-based opinion formation model, the trust an individual place in the level of expertise and the trustworthiness of a source plays a major role in deciding the extent to which it contributes towards forming an opinion. Therefore, the perceived credibility of various sources was explored as well.

Factors influencing vaccine-related attitudes of the person were then explored along the constructs of the Health Belief model.

Beliefs related to;

- Perceived susceptibility
- Perceived severity
- Perceived benefits of vaccination (Efficacy)
- Perceived barriers (Adverse effects) were thus explored.

According to the theory of planned behavior, in addition to the attitudes with regard to behavior, subjective norms and perceived behavior play major roles in forming a behavioral intention. Therefore, the content was analyzed further to identify compulsions towards vaccination and against as well as to identify what contributed to forming of subjective norms.

<https://www.sciencedirect.com/science/article/abs/pii/S0378437119310519>

Information Sources

TV as a source of information

Traditional mainstream media came up repetitively as a commonly used source of information. News programs and discussions with doctors and with state health officials were cited as sources of information. These were seen in comments such as *"we were watching TV and getting information from everywhere"*, *"The director general was always on TV and we watched the programs they came on"*, and *"A lot of doctors came on Tv and gave recommendations"*.

Commonly used digital platforms

Some of the participants claimed to predominantly rely on digital media for news. Social media platforms mentioned included Facebook, YouTube, WhatsApp, and Viber. A few of the participants said that they search on Google to learn about current affairs and the situation of the pandemic in general while some mentioned the use of Wikipedia.

Common sources to seek information

On Facebook they tended to follow journalists and *"a lot of pages"* (as it was cited by some) and enjoyed the instant delivery of news and the ability to share the news on the same platform as seen in comments such as *"I follow a lot of pages, I get a lot of news from them, I get news instantly and I share them"*. They used social media platforms to be informed of what is said by their friends as well as subject matter experts when it comes to Covid-19. *"My friends share things on FB and on YouTube that the doctors say."*

Some preferred Facebook over traditional media such as TV to stay informed of current affairs. *"I have Facebook and I follow journalists. I don't watch TV"*

Passivity in information seeking

Some of the participants did not search actively for information on digital platforms but welcomed the information they received on them. *"(I) never searched regarding any illness"*

Affinity to be vocal on social media: Consumer or disseminator

The affinity to share content related to Covid-19 was diverse among the participants. Some were quite eager to share anything they believed would be helpful to others or important as seen through comments such as *"I get news instantly and I share them"*, and *"on FB if there is an important thing that others should also see I will share them"*.

Some seem to be comfortable sharing their ideas mostly in friend circles. *"I have friends' groups and office ones, I will give comments in them"*.

Some of the participants were more mindful of sharing content even when they themselves saw nothing wrong with it. *"I don't see anything wrong in it, but I won't share it"*

A few were reluctant to share content when the creator of the content was not known even when they agreed with the gist of it personally. This was particularly true when it came to Covid-19 related content as seen in the comment *"Generally it is true, But I will not share it if I don't know the person"*.

Generally, people required a higher threshold to share certain content than to agree with the perspective personally. This was succinctly put to words by one participant *"Out of ten I can give 6 marks for (the likelihood of me) believing the post, but (the likelihood of me) sharing it will be 5. It may or may not happen."*

Credibility of Source

The expertise of the source

Expertise with regard to the subject was seen as an important aspect of credibility by most people. Many said that they'd believe statements made by doctors. Being a doctor connected to the government, appearing on TV, and being a specialist seems to increase the level of credibility as reflected in statements such as *"specialist will give the best opinion"*, *"If the doctor is connected to the Government, I'd have more faith"* etc.

The closeness of the source

While the closeness played a major part in the level of compliance *"if my family says to drink it, I will drink"* there were instances that they inclined towards the opinion of the expert when the opinion of those who were known to them was towards the contrary. This was seen in comments such as *"I go by the doctor's recommendation. Parents will also advise us, but this is not something that has happened during their time"*

A lot of trust was placed by some in international organizations as well. Particularly when it was accompanied by a document seemingly from the agency as seen in comments such as *"WHO or UN website. They are internationally recognized, you will see a document, and will believe it"*.

Verification Process

Participants had diverse methods of checking for the authenticity and accuracy of the information they receive. Searching on Google, asking parents and elders, checking with friends in friend circles, and asking a doctor was among the verification methods suggested by them. Interestingly, few mentioned checking on social media to see other people's opinions.

Sharing content on social media too was seen as a way of verifying facts as it generates discussions among people who see it as stated by some of the participants "I will share it on my groups and discuss it "

Some of the participants felt so confident regarding certain vaccine-related information that they did not see the need to cross-check. "No need to check because it was known".

Perceived Severity of Covid-19

Perception of Covid-19 as a potentially deadly disease

While most of the subjects who were in favor of vaccination perceived Covid-19 to be a deadly illness some of those who were against vaccination perceived Covid-19 to be a disease of substantial gravity.

While some of the opinions were based on learned information as highlighted by comments such as "*I can say it is deadly*" some had come to the conclusion through personal experiences. While some of the personal experiences were experienced firsthand ("*for about six months our body was weak, still, we have some discomfort*", "*We couldn't breathe, we had to fight for our lives*") there were instances in which they were direct observations among those who are closest ("*my grandmother died*", "*maybe 10 people I know died*").

While some were concerned about the potential harm to self, many were profoundly worried about the consequences of passing it on to those who they love. "*I was always thinking of my children because they are small*"

Perception of Covid-19 to be a trivial illness

Another school of thought that emerged during discussions was the perception of Covid-19 as a trivial disease of which the seriousness has been blown out of proportion. This was evident through sayings such as "*I think they took it too seriously*". Some were of the belief that while Covid-19 could be potentially dangerous for those who have multiple co-morbidities, those who were apparently healthy would probably see it through without much of an issue. They attributed the mortalities around them to prior disease conditions as apparently evident in quotations such as "*The people who died have had these complications before*". The Perception of Covid-19 being a trivial illness was commonly seen among those who opted not to take at least one of the offered doses of the vaccine.

Perceived effectiveness of unsubstantiated treatment

A group of interviewees was of the idea that there were remedies they could use to bring down the severity of the illness. Remedies suggested included traditionally used concoctions such as "*Koththamalli*", "*Veniwelgata*" and "*paspanguwa*" of which efficacy they were confident of since they believed such treatment have been commonly used to relieve flu-like symptoms. "*we steamed and drank Kothamali and got relief from the common colds, for over 30 years we have been doing it because we know that*".

While some people continued to use alternative medication, some said they had to go for alternatives initially before the introduction of vaccines, since there for no other option available. It is seen in comments such as "*We got the Dammika paniya and I drank a bit since we didn't have any options*".

The direct influence of close ones on the choices related to alternative remedies was seen in comments such as "*started to take kothamali and pas panguwa after listening to our parents. They said that was what we were given for immunization and it has worked well*".

Perceived Threat of Covid-19 - Perceived Susceptibility

Optimistic views of avoiding the illness

Optimism regarding the chances of avoiding infection with Covid-19 was seen mostly among those with anti-vaccine sentiments. Comments such as "if people were careful then they could avoid it" were encountered often.

There was a lot of emphasis on preventive practices being sufficient to avoid illness as was seen in comments such as "*felt that if people were careful then they could avoid it*" and "*We were careful because our children didn't get the vaccine*". Being "*careful*" and taking necessary precautions were perceived to provide sufficient protection with there being no need for the vaccine.

However, while some of the preventive practices they relied on to avoid infection were evidence-based such as wearing masks and washing hands, a lot of preventive practices brought-up, up were not supported by any published literature. Comments on these include;

"We used to drink Koththaamalli daily and inhaled steam daily",

"We drank hot water, the kids don't like to drink hot water but I gave them",

"Got different things from her office, like Pranajeeva",

"We drank Suwadarani, we gave our kids also, we boiled things like Pawatta and drank, morning and night we inhaled steam with kohoba leaves, we drank veniwalgatta, kothamali"

The reason for the preference for herbal remedies over vaccination was seen occasionally among comments such as "*there are no side effects in Ayurvedic products, so we took more*".

Perceived Benefits of Vaccination

High Efficacy

Most of the people who had taken the booster dose had positive sentiments about the vaccine's efficacy.

At times the belief in the efficacy of the vaccine was based on the epidemiological trends observed in society. Some attributed the recent control of the epidemic to the success of the vaccine as seen in comments such as "*It was controlled because of the vaccine*".

People who got it survived. People are freely doing things in society due to the vaccine. So, I think the vaccine is good".

At times people seem to attribute the positive outcomes among people around them to the vaccine as brought-out in comments such as *"My parents are old, so as soon as it came they got it. It gave them good protection and they survived"*.

Low Efficacy

Skepticism about the effectiveness of the vaccine was commonly seen among those who had refused the third dose of the vaccine. Comments such as *"I don't think the vaccine does a lot"* was commonly seen among them.

Most of the time this belief was based on the observation of negative outcomes among the vaccinated individuals.

Why take the vaccine if the vaccinated die as well?

Observing deaths among those who were vaccinated was cited by many as the reason for their skepticism in comments such as *"people who took the vaccine also died in front of my eyes"*. While some see the vaccinated individuals getting seriously ill *"I know a family they took the vaccine, but the husband got it and then the wife and they got serious"*, was the basis for their belief, some took mere incidence of infection among the vaccinated as sufficient reason to refute its usefulness *"why take it when people who have taken also get infected"*.

How come the pandemic spread in vaccinated communities as well?

While the above comments were based on personal experiences, some other sentiments were based on their own inferences from population-level observations. This trend is evident in comments such as *"first it was tested in Germany, then Netherlands and USA. They relied on the vaccine they injected in these countries. Although they gave the vaccines, the number (of Covid-19 incidence) went up and did not come down. In Italy, it went up. People took the vaccine as a trend, like petrol"*.

Unrealistic expectations and ambiguous communication

At times it was evident that some of the negative perceptions were based on an unrealistic expectation of the effects leading to frustration as seen in comments such as *"they told at first that you will not be infected when you take the vaccine, but people were infected, then they said you won't have to suffer from it but people got serious, then they said you won't die, but people died"*

Perceived Risks of Vaccination

The vaccine has many adverse effects

Many of those who had refused the booster dose cited their concerns on adverse effects as the reason for doing so.

While some of those based this belief on what they have observed in person ("*grandmother had complications*", "*my mother got constant headaches*"), hesitation of others were based on what they had heard as noted in comments on rumors such as "*(heard) stories that you cannot get pregnant*", and "*said to result in mental problems etc. Popular video streaming platforms and Gossip sites were mentioned as the sources of these "stories"*".

Ambiguity in communication and misinterpretation

Interestingly, some had interpreted routine practices in obtaining informed written consent prior to vaccination as evidence for adverse effects as well. The fact that one has to "*sign a paper stating that they (the medical team) are not taking responsibility*". Was given as a reason for not taking the vaccine.

The ambiguity of communication too seemed to have an effect on forming of this opinion as there were those who said "*I asked a doctor and nurse. They told it's according to the individual. I didn't want to take it*".

Side effects are there but the benefits may over-weigh them

Those who had taken the booster dose too were of the opinion that the vaccine is with potential adverse effects. However, they viewed it in a different light. As seen in comments such as "*You will not get 100% results from anything , there will be some side effects , some got blood clots after taking the booster , but we were not concerned about it and went by the doctors advice and took the 3rd dose the booster*" they were aware of the adverse effects but opted to take chances with the vaccine over the disease which they perceived to be more lethal. One of the participants said "*we must live to even have side effects, so first we must survive. If we die, then there is no point*".

Trials were hurried and unsubstantial

According to those who opted to not take the vaccine, one reason for their low trust in the vaccine is due to issues they perceived to be in the process of its development. Some believed that the vaccine was not tested with same rigor as the other vaccines as seen in comments such as "*When you take other vaccine like Rubella they test for 4 years and then give it, Corona came in 2020 and by end 2020 they gave the vaccine*".

Normative Beliefs

People in other countries resisted vaccinations

Many of the participants revealed several factors in social context that affected their decision to take or refuse the vaccine. A few of those who were against vaccination cited that there was stiff resistance against vaccine in other countries as well. Statements such as "*people in America were not taking the vaccine*" were based on what they had seen on social media.

Doctors wouldn't take it first if it was harmful

On the other hand few of the comments made it clear that healthcare workers including doctors taking the vaccine has convinced them that it is the right thing to do. Observations such as "*front line staff all got the vaccine before us*" and "*the doctors took it first and told others to take it*" were cited as reasons opting for vaccination. Most of these observations were made on social media as well as traditional media.

Compulsions and external influencers

Vaccination to comply with regulations

Some of those who had anti-vaccine sentiments had taken the vaccine due to what they considered to be undue external pressure.

In some case it was to avoid inconveniences of not being vaccinated as seen among comments such as "*I want to leave the country, so I did some search on it. We must take the vaccine if we are going overseas. That is why we were convinces to take the vaccine. I wanted to avoid getting it again in the future.*"

Some had taken the vaccine to avoid trouble with law enforcement agencies "*if the police is checking whether you have taken the vaccine it could be trouble. So I have to take the 3rd vaccine also*" while some had decided to do so to avoid issues with the employers / superiors at the workplace as seen in comments such as "*hotel recommended for me to take it, so I had to take it*".

Pressure from within the family

At times it was the pressure from family ("*my parents also wanted me to take it*") that made some opt for vaccination.

Similarly, there were instances where the family influence has been against vaccination as seen in comments such as "*my husband more than me saw not for it, so I didn't*".

Discussion and Conclusion

Participants are exposed to information from a plethora of sources. While some were predominantly passive consumers of information others played a significant role as disseminators. The affinity to share content on social media and voice their opinion varied massively from one individual to another.

Credibility was highest when it came to experts in general. However, they relied on friends' opinions to come to conclusions as well and social media provided them with a platform to exchange such opinions.

While some considered Covid-19 to be a grave disease, some considered it to be quite trivial. What they have observed around them seem to weigh in massively on this opinion. These observations may be on social media or in person among those whom they associate daily.

The opinions on the efficacy of the vaccine too were seen to be diverse among participants. While some of the personal observations around them seem to be affect this belief, population level observations in the greater society and how they interpret such observations too seem to affect this opinion greatly.

Mortalities among those who were vaccinated was seen as evidence of low efficacy by some while some considered the mere fact that a vaccinated individual may still be infected with the virus to be evidence of such. It was clear that some of those who harbored anti-vax sentiments were confused as to what realistically could be expected from the vaccine. The change of such expectations with changing circumstances and better penetrance of information to their information spheres with time seem to cause confusion.

Both those who were in favour of vaccination and those who were against it were generally aware of the existence of adverse effects but the magnitude in which they perceived it and the way they it was interpreted were quintessentially different. Those with antivax sentiments saw this as a reason for not taking the vaccine. Even the act of signing the informed written consent form acknowledging the possibility of adverse reactions was seen as an ominous sign. Ambiguity in certain communications too were seen to add to the confusion.

However, while they were aware of the adverse effects, those who were in favor of vaccination came to their conclusion by weighing it up against the perceived benefit of vaccination and the severity of the disease.

While some of the preventive measures mentioned by the participants were indeed proven to be effective in literature, many of the home remedies seem to be based on unsubstantiated claims. While being perceived by many in the community to be effective against flu like symptoms, being trans generational in practice etc. were taken to be evidence for effectiveness of such practices being based on herbal products was seen as a sufficient reason to rule out any possibility of an adverse effect. Such high confidence placed on these unsubstantiated remedies were seen as a reason to be optimistic of avoiding Covid-19 infection and therefore not needing vaccination.

What's observed on social media was seen to be interpreted with a confirmatory bias to support their personal beliefs on vaccination. Some who saw resistance against vaccination in foreign countries viewed it as a reason to be more sceptic. At the same time those who were in favor of vaccination brought out the fact that other countries have had their vaccination campaigns as reasons to believe in vaccines.

Social media was seen to be quite effective in setting subjective norms. Seeing frontline workers including doctors being vaccinated was taken as a reason to believe in the efficacy of the vaccine.

In addition to personal beliefs, there seem to be considerable external pressure on individuals affecting the decision of getting vaccinated. While the institutional and perceived national level pressure seem to be generally in the direction of vaccination, the pressure from within the family seem to be for or against vaccination on different occasions.

5.3 Component 3: A Quantitative Study

We approached 436 adults in Colombo District, out of which 323 (74.1%) consented to take part in the study. Out of 323 respondents 166 (51.4%) use social media daily.

Demographic

Gender

Covering across the age range 18 – 60 years (mean age 34years), and both urban (74.1%) and rural (25.9%) sectors. Gender representation of the sample of achieved to 50:50 ratio. Education attainment of the sample was represented as below where majority had the local advance level qualification.

Level of Education

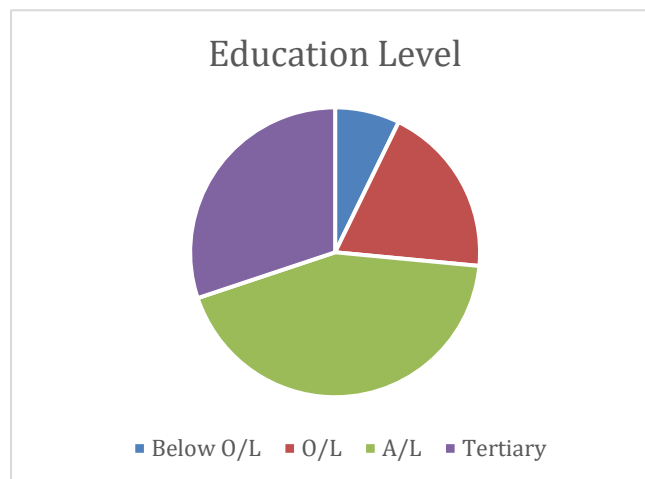


Figure 5.1: Level of Education

Socio-economic classification

The socio-economic representation was skewed to top 2 socio-economic classification levels.

Table 5.2: *Socio-economic classification*

| SEC | % |
|-----|------|
| A | 31.9 |
| B | 32.5 |
| C | 24.7 |
| D | 6.0 |
| E | 4.8 |

Different levels in the vaccination process

Sample represented individuals who had different levels in the vaccination process. 74% of the sample had completed two doses of the vaccine

Table 5.2: *Different levels in the vaccination process*

| Number of Covid-19 Vaccines Taken | % |
|-----------------------------------|-------|
| 0 | 12.05 |
| 1 | 13.85 |
| 2 | 40.36 |
| 3 | 33.73 |

Usage pattern and purposes of different social media (SM)platforms

The complete sample were uses of different social media (SM)platforms that are available, however the usage pattern and purposes differed across the sample.

Table 5.3: Usage pattern and purposes of different social media (SM)platforms

| Purpose of SM Use | % |
|-----------------------------|----------|
| KIT with friends | 94.0 |
| Informed of current affairs | 98.2 |
| Influence | 10.8 |
| Play games | 42.4 |
| Entertainment | 85.4 |
| Share info | 84.8 |

Sources of learning current affairs

As SM had been popularly used for being updated on current affairs, the exact sources were explored where the popular sources were Television, Facebook and YouTube.

Table 5.4: Sources of learning current affairs

| Sources of learning current affairs | % |
|--|----------|
| TV | 86.7 |
| Dark Social | 64.2 |
| YouTube | 86.1 |
| FB | 80.1 |
| Instagram | 31.1 |
| TikTok | 8.1 |
| Gossip Sites | 30.1 |
| WoM | 52.5 |

Sources of credible information

On sample understanding on what is identified as a credible source to accept the information, sources of credible information for health-related information were:

Table 5.5: Sources of credible information

| Source | Credibility Mean Score |
|--------------------------|-------------------------------|
| Gov. Org | 3.86 |
| INGO | 4.19 |
| Doctor through a journal | 4.02 |
| Doctor | 4.36 |
| Celebrity | 2.87 |
| Personally known | 3.67 |
| Medically related | 3.05 |

Audience shared

INGO, Journals by doctors, doctors were most credible sources followed by government organization that scored 3.86. When sharing these information and beliefs built from the information attained.

Table 5.6: Audience shared

| Audience Shared | % |
|------------------------|----------|
| Family | 95.2 |
| Friends | 91.6 |
| SM | 51.2 |
| Other | 59.0 |

Sentiment

62.5% of the antivax sentiments were skewed to adverse effects of the vaccine while 23% were optimistic bias and 17% believe there were other alternatives.

Table 5.7: Sentiment

| Sentiment | % |
|-------------------|----------|
| Adverse effects | 62.5 |
| Low effectiveness | 26.78 |
| Optimistic bias | 23.21 |
| Alternatives | 17.86 |

Vaccine Sentiment – Adverse Effect

Table 5.8: *Intensity of Vaccine Adverse Effect*

| Intensity of Vaccine Adverse Effect | % |
|--|----------|
| Usually severe | 91.43 |
| Trivial | 7.14 |
| Rare | 1.43 |

Among the 62.5% who believe that there are adverse effects in the vaccine 91% believed that these effects were severe

What's considered to be evidence

Evidence for believing adverse effects in vaccine are predominantly through personal observation (39.8%) followed by SM that is 29.7%.

Table 5.9: *What's considered to be evidence*

| What's considered to be evidence | % |
|---|----------|
| personal observations | 39.84 |
| SM | 29.69 |
| Traditional Media | 10.94 |
| Personally experienced | 19.53 |

Believing system

When tried to understand who else believes this evidence of adverse effects of vaccine 47% claimed friends and 17% SM. However, the source of affirming friends believed the same was through meeting the friends personally (92%) and friend's SM 78%.

Table 5.10: *Believing system*

| Who else believes this | % |
|-------------------------------|----------|
| Friends | 46.66 |
| SM | 17.33 |
| Celebrities/influencers | 2 |
| Experts | 8 |
| Pages/channels | 11.33 |
| Mainstream Media | 14.66 |

| How did you get to know your friends' believes | Agreeing % |
|---|-------------------|
| Personally meeting | 92.88 |
| SM | 78.57 |
| Mutual friends | 74.28 |

Believing system of the experts

Expert beliefs on the vaccine are also predominantly know through SM (100%) and largely accepted expert for health information are doctors (100%).

Table 5.11: Believing system of the experts

| How did you get to know Experts' believes | Agreeing % |
|--|-------------------|
| SM | 100 |
| Personally meeting | 50 |
| Mainstream M | 91.67 |

| Who are the experts | Agreeing % |
|-------------------------------|-------------------|
| Doctors | 100 |
| Alternate practitioners | |
| Faith Healers | |
| Clergy | |
| Scientist/ Research Scholars) | 41.67 |
| Activists | 5.88 |

Vaccine Sentiment – Efficacy

26.78% antivax sentiments were due low effectiveness of them 76.67% believed so because their friend's believed the same.

Table 5.12: Vaccine Sentiment – Efficacy

| What's considered to be evidence among those who believe in low efficacy | % |
|---|----------|
| People got the disease after vaccination | 73.34 |
| Friends say so | 76.67 |
| Celebrities say so | 3.34 |
| Experts say so | 10 |
| Personal Experience | 6.67 |

Friend's belief of low efficacy of the vaccine

When looking at their source for knowing their friend's belief of low efficacy of the vaccine, 95.65% learnt it through SM and 100% through mutual friends.

Table 5.13: Friend's belief of low efficacy of the vaccine

| How did you get to know your friends' believes | Agreeing % |
|---|-------------------|
| Personally meeting | 73.91 |
| SM | 95.65 |
| Mutual friends | 100 |

People being Covid-19 infected post vaccination

Of the 73.34% who attributed low efficacy due to people being Covid-19 infected post vaccination, 77.27% learnt about this through SM and 90.91% through mutual friends.

Table 5.14: People being Covid-19 infected post vaccination

| How did you get to know this | Agreeing % |
|-------------------------------------|-------------------|
| SM | 77.27 |
| Mainstream M | 54.55 |
| Meeting friends | 90.91 |

Vaccine Sentiment –Alternatives

17.85% claim that there were other alternatives to the vaccine. 44% claimed seeing effectiveness of alternative for people around while 28% claimed friends and experts to have influenced such belief with them.

Table 5.15: Vaccine Sentiment –Alternatives

| What's considered to be evidence among those who believe in low efficacy | % |
|---|----------|
| Has worked for people around me | 44% |
| Friends say so | 28% |
| Celebrities say so | 0% |
| Experts say so | 28% |

Influenced efficacy of alternative

Among these 28% each of friends and experts to influenced efficacy of alternative, their beliefs of alternative have been learnt through SM 100% and 40% respectively.

Table 5.16: Influenced efficacy of alternative

| How did you get to know your friends' beliefs | Agreeing % |
|--|-------------------|
| Personally meeting | 80 |
| SM | 100 |
| Mutual friends | 60 |

| How did you get to know Experts' believes | Agreeing % |
|--|-------------------|
| Personally meeting | 60 |
| SM | 40 |

Vaccine Sentiment – Pro-Vaccine

Of the sample who had taken the booster were considered as Provac, the sample compromised of 33% Pro vaccine. When explored from provax their reasons for taking the booster 62.96% claimed they personally wanted to take the jab.

Table 5.17: *Vaccine Sentiment – Pro-Vaccine*

| Reasons for taking the booster dose | % |
|--|----------|
| Due to regulations | 22.22 |
| As advised by the doctor | 14.81 |
| Personally wanted to | 62.96 |

Level of fear and reservation towards the vaccine being administered

80% claimed that they were not afraid of taking vaccine while 20% had some level of fear and reservation towards the vaccine being administered. This fear was due to possible adverse effects of the vaccine (100%)

Table 5.18: *Level of fear and reservation towards the vaccine being administered*

| Did you have doubts | % |
|----------------------------|----------|
| Adverse effects | 100 |
| low efficacy | 0 |
| better alternatives | 0 |
| other | 22.22 |

Adverse effect has been overcome by observation

This fear of adverse effect has been overcome by observation 77%.

Table 5.19: Adverse effect has been overcome by observation

| | 2 Completed | 2 Not Completed |
|---|--------------------|------------------------|
| Male | 0.76 | 0.24 |
| Female | 0.72 | 0.28 |
| Chisq = 0.28247, df = 1, p-value = 0.5951 | | |

| How was it overcome | % |
|------------------------------|----------|
| Observing it to be safe | 77.8 |
| Observing it to be effective | 77.8 |
| Expert opinion | 22.2 |
| Influencers | 0 |
| Other | 0 |

Factor Association

A factor association analysis was carried out segmenting the sample to two groups as; individuals who had taken the 2nd dose and who had not. Among the two genders groups when associated the vaccine taking behavior according to the mentioned split, 76% and 72% of males and females respectively had taken up to the 2nd dose.

When looking at vaccination status as of 2nd dose within the Socio-Economic classes that had been studied. When analyzed it can be seen that most of who hadn't taken the 2nd vaccine were from Socio Economic Segment A, B (highest segment) and E (the lowest).

Table 5.20: Factor Association

| SEC | 2 Completed | 2 Not Completed |
|-------------------|--------------------|------------------------|
| A | 0.75 | 0.25 |
| B | 0.61 | 0.39 |
| C | 0.85 | 0.15 |
| D | 0.9 | 0.1 |
| E | 0.75 | 0.25 |
| p-value = 0.06794 | | |

Use SM to be aware of current affairs

Among who use SM to be aware of current affairs, when checked on the vaccination completion, 67% of who used SM for to be up to date on current affairs have not taken the second vaccine, while the majority (75%) who don't use SM for to be updated on current affairs had completed 2 vaccines.

Table 5.21: Use SM to be aware of current affairs

| SM for current affairs | 2 Completed | 2 Not Completed |
|-------------------------------|--------------------|------------------------|
| Agree | 0.33 | 0.67 |
| Disagree | 0.75 | 0.25 |
| p-value = 0.1648 | | |

Perceived credibility of doctors

Among those who perceived doctors to be a credible source of vaccine related information, 75% had taken both the doses of Covid-19 vaccine while only 58% among those who did not perceive them to be credible did so.

Table 5.22: Perceived credibility of doctors

| Doctors as a source of information | 2 Completed | 2 Not Completed |
|---|--------------------|------------------------|
| Not credible/ Neutral | 10 (58%) | 7(41%) |
| Credible | 113(75%) | 36(24%) |
| p-value = 0.14 | | |

However, there was no statistically significant difference between the two (p-value = 0.14).

Perceived credibility of government organizations

Among those who perceived doctors to be a credible source of vaccine related information, 76% had taken both the doses of Covid-19 vaccine while only 68% among those who did not perceive them to be credible did so.

Table 5.23: Perceived credibility of government organizations

| Goc. Organizations as a source of information | 2 Completed | 2 Not Completed |
|--|------------------------|----------------------------|
| Not credible/ Neutral | 22 (68%) | 12(35%) |
| Credible | 101(76%) | 31(23%) |
| p-value = 0.16 | | |

However, there was no statistically significant difference between the two (p-value = 0.16).

Discussion and Conclusion

Out of those who regularly used social media almost all (98.2%) used it to stay informed of current affairs. This emphasizes the importance of the role social media play in the information landscape. Closely behind television (86.7%), YouTube (86.7%) and Facebook (80.1%) were two of the main sources people used to seek information on current affairs.

In contrast to the use of social media for information seeking, only half the social media users (51.2%) used it to share their beliefs. The rest resorted to word of mouth among friends and family. This implies a significant spill-over effect from social media to general social networks, where information is gathered on social media and then disseminated through WoM, resulting in exposure of those who don't use social media to its content as well. On the other hand, it is of importance to note that significant dissemination of information on social media occurs through roughly half its users in the sampled community. These would be the nodes that amplify whatever the information they pick-up on social media on the platform itself.

According to the agent-based opinion formation model, the likelihood of someone changing the opinion on a matter based on the input of a person depends on that person's perceived credibility. The most credible source as perceived by participant used to be doctors with 88.6% of the people placing trust in them. In comparison only 71.7% felt that governmental organizations were a trustworthy source.

Reasons for Anti-vaccine sentiments

Those who had either refused the booster dose or were regretting being vaccinated were questioned further on the reasons for those sentiments. Questions were designed along the constructs of the Health Belief Model.

Among all identified reasons, the most common reason for the antivaccine sentiment happened to be, perceived adverse effects. Given that any vaccine or therapeutic agent has its

own adverse effect profile being concerned of adverse effects may be normal. However, the perceived magnitude and the frequency of such effects may affect the decision to get the vaccine. It was interesting to note that 91.4% of the people who had anti-vaccine sentiments were of the belief that adverse effects of the vaccine were common and severe. Only 5 (7.1%) of them had realized that they are usually trivial.

According to the theory of planned behavior the behavioral intention, Normative beliefs play a major role in forming behavioural intention by forming subjective norms. Therefore, the exposure of each individual to similar opinions of others was explored.

Adverse effects

When those who gave adverse effects as the reason for their anti-vaccine sentiments were asked where they found evidence to form the conclusion, less than 30% initially said that it was on social media. However, this may be only the most superficial level of influence exerted by social media. When they were asked where else they have seen similar opinions only 17.3% named social media initially while 46.6% named friends and family. However, it was interesting to note that nearly 78% who said that their friends had a similar opinion said that they got to know their friends' attitude through social media. This uncovers an interesting dynamic related to social media that isn't exposed without probing deeper into the information network. This may suggest that without adequate probing into information dissemination networks, having only superficially placed questions may end-up with studies underestimating the effect of social media on attitude formation.

Similarly, 8% said that they had seen experts sharing the same sentiment of vaccine related adverse effects. Again, all of them (100%) said that social media was a source through which they were exposed to experts' opinion. Interestingly 100% of them considered doctors to be experts and only 41% believed researchers other than doctors to be experts. Perception that experts who happen to be doctors share anti-vaccine sentiments may be a result of either disinformation campaigns or a misinterpretation of well-intended messages. In either case this should be considered a strong indication of the importance of responsible social media use by healthcare workers.

A study (Vosoughi et al., 2018) done on the spread of false news on Twitter revealed that false news travels 70% faster on social media than true news and that it was solely due to sharing by users and not bots. This phenomenon was attributed to falsehoods being more novel and more potent in eliciting high arousal feelings such as anger and fear. This might very well be the reason why rare side effects get greater reach in social media while those who develop not adverse effects following vaccination are under-represented in social media.

Low efficacy of the vaccine

Among those who harbored antivaccine sentiments, 26.7% believed the efficacy of the vaccine to be low.

Among those who believe that vaccines were low in efficacy 76.6% believed so because of what their friends said. However, when probed into how they got to know what their friends think, 95.7% said that it was through social media while the number who said that it was through meeting them in person (72%) was less.

Out of the people who perceive vaccines to have low efficacy, 73.3% claimed to have seen people getting Covid-19 despite vaccination and interpreted it as evidence. Among them 77.2% have made such observations on social media.

This signifies several levels at which social media plays a role in formation of the notion that vaccines are not adequately effective.

Better alternatives

Among those with anti-vaccine beliefs, 17% said that the existence of better alternative was the reason for them being against vaccination. While 27.8% of them believed so because their friends shared this belief a similar number felt that experts shared the belief as well. Interestingly, all of those who had this perception of their friends' belief claimed to have made that observation on social media.

Pro-vaccination

Out of the 54 participants who had taken the booster dose and were not regretting it, majority (62.9%) had done so because they decided it was the best line of action. Interestingly, 22.2% claimed that existent or anticipated regulations paid a big part in the decision.

Among them nearly a fifth (19.1%) claimed that they had second thoughts of taking the vaccine at one point and they all seemed to have been centred around the claims of adverse effects. Observing those who got the vaccine to not have had any serious issues was the factor that was claimed to have helped most (77.8%) of them overcome it and 77.8% had made these observations on social media.

Factors associated

There were no statistically significant relationships between socio-demographic characteristics and the likelihood of completing vaccination. It is possible that the sample was too small to provide the study with adequate power to yield significant relationships. However, a deep neural network trained with 80% of the subjects, validated on 10% and tested on 10% turned out to be 86% accurate in the confusion matrix. However given the small size of the data sample this is inconclusive and will need a larger data set to be trained on.

7.0 Recommendations

1. The salient finding of the study seems to be the fact that social media plays a bigger and more complicated role in shaping behavioural intentions through different pathways. This influence is not adequately captured in traditional questions such as "Do you seek such information on social media" or "Was what you saw on social media a reason to come to this conclusion". Influence of social media is most of the time made covertly without explicit recognition by the participant. The study identified three levels at which social media may influence an opinion. It would be advisable to reach such depths in studying the effect of social media on health information landscape in future research as well in order to avoid underestimation of the impact.
2. The importance of the role played by social media in shaping subjective norms was clearly identified through the study. This can be attributed to the fact that false news / exaggerated news tends to get shared more readily than true information. In order to balance the scales, it would be prudent to mobilize communities on social media post anecdotal narratives of the safety of vaccines as well. Forming Facebook groups and working closely with existing communities to saturate social media with true anecdotes may be more effective than relying on scientific explanations of probability of occurrence. Such logic was rarely used in organic conversations on social media and did not demonstrate satisfactory uptake in the community.
3. One of the main reasons for not taking the vaccine was the strongly held faith in alternative treatment modalities. It is clear that even interventions that may not cause any harm to those who use it, can still have a significant impact on the healthcare delivery system through a false sense of security. Therefore, it would make sense for authorities as well as community moderators to be proactive against unsubstantiated claims of various therapies shared on social media.
4. Health communications may need to have more transparency in order to be deemed more credible among the more sceptic fractions of the public. Being forthright about possible adverse effects may help with complains cover-ups and related conspiracy theories. However, communication needs to be made extremely clear and simple in order to avoid being intentionally or unintentionally misinterpreted.
5. It was revealed that social media users perceive healthcare workers to be extremely credible sources of information. Alarmingly though those who decided not to get vaccinated due to perceived severe adverse effects and low efficacy claimed that some of the information that led to the conclusion came from doctors on social media. While some can be considered misinterpretation of content shared, it can also be due to disinformation as well. It would be prudent to support educational sessions for doctors on ethical use of social media to impress on them the importance of their social media use in health information landscape. It would also be advisable to work with statutory governing

bodies of medical practice and ethics to assist them in developing and implementation of regulations with regard to responsible social media use by healthcare professionals within the scope of medical ordinance.

6. A deep neural network trained with data including perceptions of the participants such as faith in government health organizations, International Health Organizations, the faith in doctors ect. predicted the likelihood of an individual taking up the booster dose of the vaccine with moderate accuracy. However, it needs a much larger database to be trained with. This implies the possibility of using social media behaviour of an individual as proxy measures to identify those who are likely to refuse vaccines. If identified correctly this could be used to target at risk individuals with relevant health messages to nudge them towards making the healthy choice for him/herself as well as the community. This would only be possible through close collaboration between social media platforms and public health and communication experts.

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